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Attorney Docket No. NC25571

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: GVENTER, BRIAN } Examiner: BELL, MELTIN
Serial No.: 09/923,215 } Group Art Unit: 2121
Filed: 08/06/2001 }
For: }

To the Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

DECLARATION UNDER 37 C.F.R. 1.131

I, Brian Gventer, declare that:

- I am the inventor, who on 08/06/2001 filed the above identified application (present application).
- I conceived the invention in this country long prior to 8-12 July, 2001(hereinafter referred to as the *effective date of reference*), the publication date of the *Pires* reference titled "Remote Monitoring and Inspection of Robotic Manufacturing Cells".
- on September 26th, 2000, long prior to the *effective date of reference* of the *Pires* reference, I submitted an invention report titled "Production pattern-recognition Artificial Neural Net (ANN) with event-response Expert System (ES) [YIELDSHIELD]" to the Nokia Mobile Phones Patent department; a true copy of the invention report is attached herewith as *Exhibit 1*.
- on October 6th, 2000, long prior to the *effective date of reference* of the *Pires* reference, I submitted an invention report titled "Advanced Production Test System for 3 Second Cycle Time Cellular Handset Production Line" to the Nokia Mobile Phones Patent department; a true copy of the invention report is attached herewith as *Exhibit 2*.
- subsequent to *Exhibit 1* and *Exhibit 2* being accepted for patenting by the Nokia patent committee, I worked with the Nokia Patent Attorney to discuss and review drafts of the application, and assisted in the preparation and filing of the present application.

Exhibit 1 and Exhibit 2 show conception and possession of the invention described in the present application prior to the *effective date of reference*.

I acknowledge that willful false statements and the like made by me are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true.

Respectfully submitted,

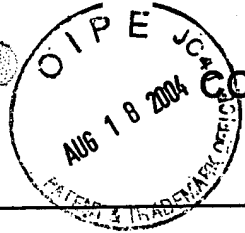
Applicant

By:

Brian Gventer

Date:

17 August, 2004



INVENTION REPORT

Origin All: 1000?

| | | | |
|---|---|--|--|
| Title of invention: Production pattern-recognition Artificial Neural Net (ANN) with event-response Expert System (ES) [YIELDSHIELD] | | INVENTION REPORT RECEIVED | |
| | | Code: <i>NC 255 71</i> | Patent Committee: <i>ANNP/Truving</i> |
| THE DESCRIPTION OF THE INVENTION MUST BE ATTACHED | | Place: <i>Truving</i> | Date: <i>28.09.00</i> |
| | | Signature: | |
| Inventor's name, employee number, title and nationality: *) Brian Gventer, 10097026, Test projects Supv. (Americas), US | Home Address: *) 7554 Bryce Canyon Drive Fort Worth Texas 76137 | Business Unit and cost centre: Manufacturing Solutions Test Group 7011315 | |
| Line Manager(s): Mark Dewitt | | | |
| Project: *) Advanced Test Concept | | Project Manager: Brian Gventer | |
| Office address: *) 14901 Trinity Boulevard, Fort Worth, TX 76155 | | | |
| Phone: *) 817 490-7072 | | Fax: *) | |
| The invention becomes public on: | | | |
| <input checked="" type="checkbox"/> I am We are the sole/ and original inventor(s) of this invention. The company may, by virtue of applicable legislation, be entitled to full or partial rights to the invention. I/ We acknowledge my/ our obligation to sign as inventor(s) all documents that may be required for protecting the invention in different countries. Applicable to inventions made by inventors employed in FI, DK, DE and SE only. Unless the inventor requests the Invention Report to be responded to within four (4) months from the date this Invention Report is received or such other period as the mandatory provisions of the applicable local law may otherwise require the inventor consents to the right of the employer to use a reasonable period of time for the evaluation of the invention. A reasonable period of time may exceed four (4) months. <input checked="" type="checkbox"/> I/We request that the Invention Report be responded to within four (4) months. | | | |
| Date: Signature(s) of Inventor(s): | | | |

*) See the instructions

| | | |
|---|--|---|
| I have read and understood the invention described in this Invention Report | | 1 |
| Date: <i>09/26/2000</i> Signature of Manager: | | |

INSTRUCTIONS FOR COMPLETING THE INVENTION REPORT

This Invention Report form is used in cases where an invention has been made by an employee of the Company. This Invention Report is confidential. Only the Patent Department may make copies of signed Invention Reports in order to request opinions or reply to the inventor(s).

The inventor completes the Invention Report and the description of the invention. The inventor does not fill in the 'Invention Report received' field. This field is filled in by the Patent Department. The Invention Report must have the names of all the inventors and their home addresses. If there is not enough space for all the names, addresses etc, please write them on a separate attachment. The first mentioned inventor is assumed to be the contact person in matters concerning the Invention Report. In the fields of office address, phone and fax, please fill in the contact person's information. Fill in the project field, if the invention is made in a project. The original Invention Report is signed by all inventors. Each page of the original Invention Report is signed by a Manager. In case it is difficult to obtain Manager's signature your Patent Department will take care of it.

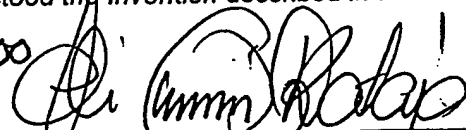
It is suggested that the Invention Report and the description of the invention should be filled in as thoroughly as possible. If drawings or other kind of information cannot be attached to this form, they should be delivered separately.

The signed Invention Report is given directly to the local or business unit's Patent Department. Invention Report should also be sent by E-mail to the Patent Department. The Patent Engineer will inform the inventor of receiving the Invention Report. The Patent Engineer will obtain any expert opinions needed to properly evaluate the invention, will procure the Company's decision and inform the inventor accordingly.

I have read and understood the invention described in this Invention Report

2

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DESCRIPTION OF THE INVENTION

Please, describe your invention in the following order. You can enclose the drawings on a separate document.

1. Field and background of the invention

Cellular RF handset production testing and statistical monitoring.

2. A summary of the invention

Artificial Neural Net (ANN) coupled with an Expert System (ES) which monitors production test plans in real-time. The ANN recognizes and classifies production yield patterns occurring at individual tester, complete test stage, and production line test aggregation and executes a proscribed range of responses. The ANN will automate human statistical analysis and line monitoring functions, identify emerging yield trends, identify proximate cause of a yield-degrading event, classify event severity, and provide conclusional accuracy. The ES, based on recognized or inferred conditions provided by the ANN, consults it's knowledge base and applies cognitive heuristics to execute reponses in the manner described by the human expert it is modeled after. These responses may include a summary report electronically to the correct individuals, a voice/pager message to the individuals responsible to react to an event, a visual or audible alarm at the event site, and/or direct adjustment of the production process.

3. Describe the problem which the invention overcomes

An experienced human monitoring the process with undivided attention is still unable to effectively monitor and identify a yield threatening trend. The intricacy and range of data managed by a single tester in production is currently difficult for less than experienced engineers. The ability for many individuals to further understand and correlate the measurement values and hidden inter-relationships is exponentially complex when stages of 10 testers are aggregated, compounded yet again by correlating inter-relationships between test stages.

4. How was the problem solved earlier?

A classic example of the problem is *power level 2 upperband tuning* failures across 8 testers in Final/UI (Final Assembly Test Stage). In this instance the failure is induced by a particular tester at Flash SWA (SMD Test Stage) incorrectly tuning power levels due to faulty calibration. Currently, a sharp engineer standing there and concentrating as the event unfolds, may realize that the failures are all from a single source. Typically on a fully alert day shift this realization occurs after hundreds of phones are incorrectly built, and yields are severely degraded. In a night shift weekend scenario a problem may last until Monday morning.

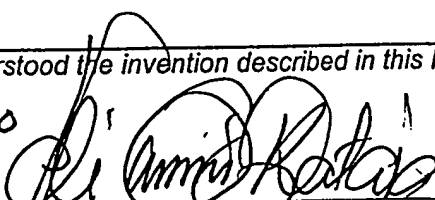
Deep understanding of the vast amount of data is done through exhaustive SPC statistical analysis. The linear regression techniques usually require very thorough calculations by a black-belt level statistician seeking specific information and rarely turns up unknown or hidden inter-related data points or inter-dependancies. The deep data mining by humans ordinarily is days or weeks after an event.

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5. How does the invention improve earlier solutions? Advantages and disadvantages of the invention?

An ANN can identify and classify the same trend, recognize the pattern at 3-5 failures (in this example about 24 phones), hand off to the ES which pages a technician, provides event statistics to support the conclusion, and takes the out of cal tester off-line. The ANN can also recognize a seemingly unrelated test value is erratic or different from values in passing DUTs, thereby interpolating an inter-dependancy or trend indicator previously unrecognized. Rework is reduced drastically and more consistent monitoring is achieved.

A disadvantage is even self-learning ANN models will need periodic review/updates to ensure optimum accuracy. Expert Systems are only as accurate as the knowledge base and need periodic updating as well. Expert systems are dependent upon the ability of a knowledge engineer to extract accurate, precise heuristics from a bona-fide human expert.

6. Brief description of the drawings (Please enclose drawings and figures of the invention on a separate document)

A. Nokia's current and future general cellular handset production testing process.

1. ANN monitors test plan results in real-time measuring individual stage trends (100+ points of data per tester, per iteration, per stage, running concurrently). Weighs trends at each stage, and correlations between stages. Reports pattern recognition when conclusional accuracy is above a specified threshold.
2. Expert system consults knowledge base for rules governing response to ANN recognized pattern, and executes applicable responses.

7. A more detailed description of the invention (if known at the moment)

8. Explain, how the invention is/can be implemented. Which would be the best mode of implementation?

ANN and ES are modeled separately. A specific build in a pre-production evaluation area with a limited number of testers, no production impact, and low volume environment to eliminate risk. Once stability is confirmed and ANN/ES linkage verified, a specific production line will field a a prototype system in full production. Once the system is confirmed functionally sound and reliable, the whole factory will evaluate and suggest final modifications. Upon final modification the system is fielded globally in production.

Models are evaluated for accuracy, currency, and dependability on a routinely, frequent enough to ensure 87-92% accuracy of the ANN and up to date heuristics.

9. Explain how we can recognise if a competitor is using the same product/feature?

Currently no AI solutions provider or business appears to have an existing system which we can buy off the shelf. For this reason we are required to either develop this system ourselves or outsource it. Ownership of the IP provides us flexibility with whom, what portions of, and when the system can be outsourced.

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10. Is it planned to use the invention in a Nokia product? If so, when and in which product?
Is the invention standard related? Advanced Test Concept – DCT5 Production Test
 Methodology 4Q2002

11. Abbreviations

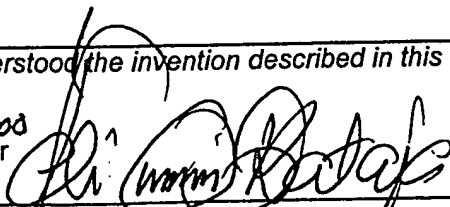
ANN – Artificial Neural Network: a computer model composed of a large number of interconnected, interacting processing elements organized into layers. Mimics behavior of human nervous system at the neuron level. ANN reasoning is associative in nature.
 ES – Expert System: A problem solving and decision making system based on knowledge of its task and logical rules and procedures for using the knowledge. Knowledge and logic are codified from the experience of human specialists in the field. ES reasoning is cognitive and rule-based in nature.

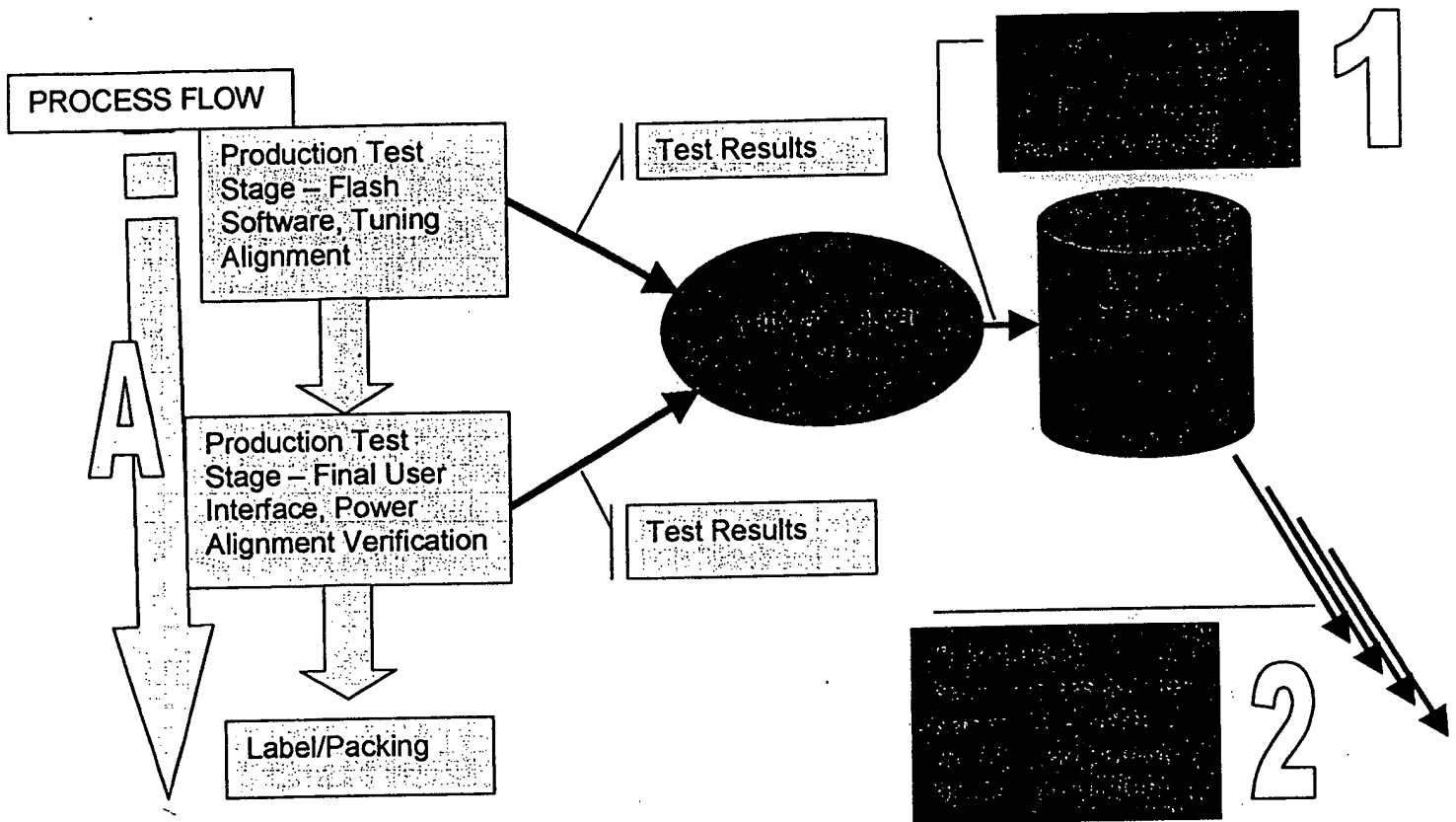
12. Any further comments

See attached drawing –page 6

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A. Nokia's current and future cellular handset production testing process.

1. ANN monitors test plan results in real-time measuring individual stage trends (100+ points of data per tester, per iteration, per stage, running concurrently). Weighs trends at each stage, and correlations between stages. Reports pattern recognition when conclusional accuracy is above a specified threshold.
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